NCR REFERENCE MANUAL

An Educational Publication

PRODUCT INFORMATION---NCR Century SERIES
MAGNETIC FILE PERIPHERALS

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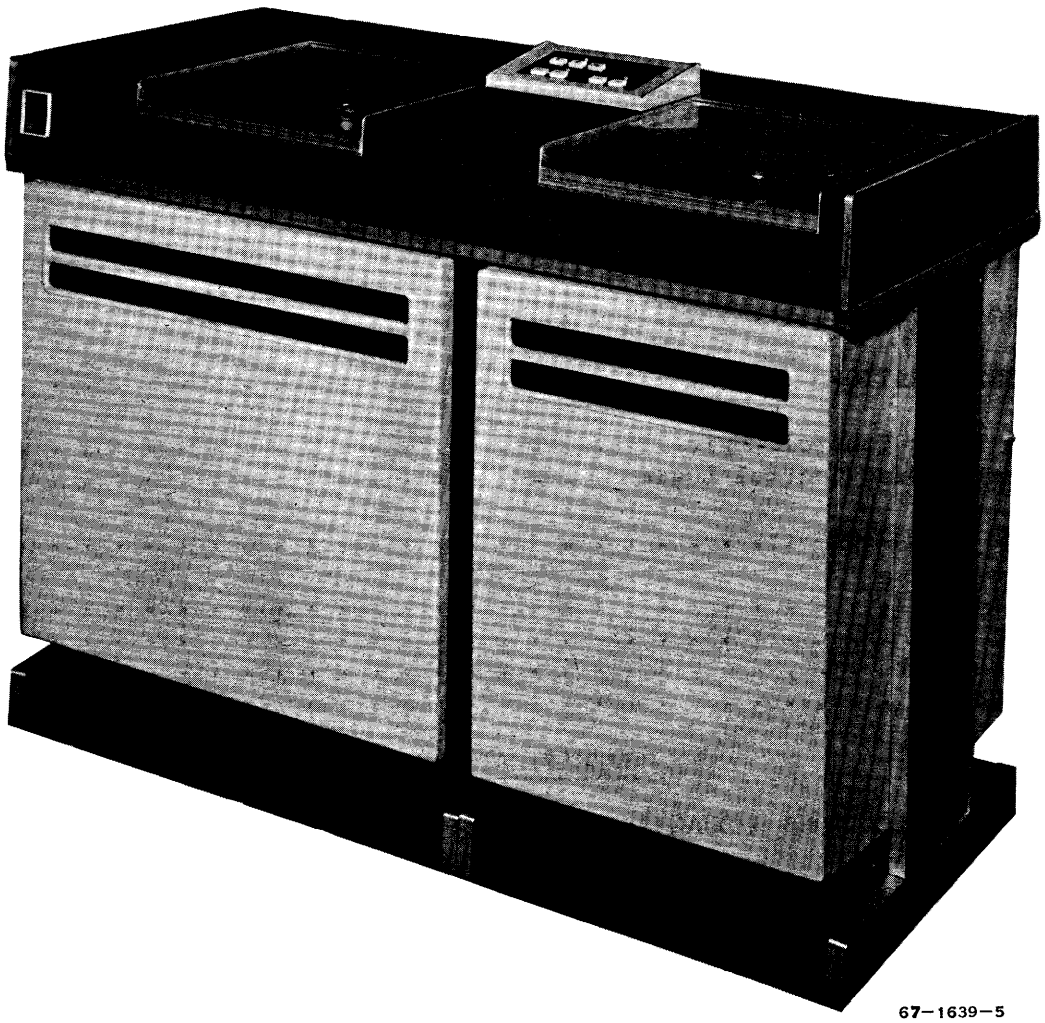
INTEGRATED DUAL—SPINDLE DISC UNITS

655-101, 655-102



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This publication contains a functional description of NCR Century Series integrated dual-spindle disc units. It has been written with the assumption that the reader is thoroughly familiar with the material contained in publication ST-9402-31, BASIC NCR DISC CONCEPTS.

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INTRODUCTION

Integrated dual-spindle disc units are so named because the disc control circuitry is part of the NCR Century 100 I/O control circuits (i.e., integrated). All NCR Century 100 systems must have one integrated unit (655-101); one additional unit, designated as model 655-102, may be optionally assigned to the integrated disc control. Both models are discussed as one in this publication since they are identical except for designation.

The integrated disc control is capable handling one read, write check, or write function at a time. The control also generates parity for a write operation and checks parity during a read operation.

If a NCR Century 100 System requires more than two disc units, freestanding dual-spindle disc peripherals (655-201) and freestanding disc control units (625-101) may be added as required. These freestanding units and their associated control units operate independently of the integrated units.

PHYSICAL DESCRIPTION

INTRODUCTION

The integrated dual disc unit is designed to operate two disc packs that are independently mounted, accessed, and removed. Each pack has a dust cover hermetically sealed to a protective base. This cover remains sealed until the pack is physically mounted; the cover reseals before the pack can be removed from the unit.

The disc packs rotate at 1440 rpm (41.67 milliseconds per revolution), and the data transfer rate is 108kb (thousands of characters per second). Each pack contains more than 4 million characters; consequently, there are more than 8.3 million characters available in each disc unit.

CONTROLS AND INDICATORS

The control panel contains three controls - POWER ON, POWER OFF, and RESET - common to both disc packs. The START and STOP controls are duplicated, one for the right disc pack and one for the left.

- The POWER ON Switch and POWER Indicator

  Pressing the POWER ON switch applies 115-volt line power to the integrated dual disc unit. The white POWER indicator lights only when power is on.

- The POWER OFF Switch

  Pressing this switch removes line power from the integrated dual disc unit and turns the POWER indicator OFF.

- The RESET Switch and CHECK Indicator

  The CHECK indicator lights when a malfunction is detected in either disc unit. The RESET switch is used to clear any resettable error condition. The RESET switch is locked out when either disc pack is in the ready state.

- The START Control and READY Indicator

  There is a START control and READY indicator for each disc pack. Pressing the START control puts the associated disc unit into the ready state if no malfunctions exist. The green READY indicator lights only when the disc unit is in the ready state. The START control can be used to remove the unit from the standby state.

- The STOP Control and STANDBY Indicator

  There is a STOP control and STANDBY indicator for each disc pack. Pressing the STOP control takes the disc unit out of the ready state and places it in standby, which causes the yellow STANDBY indicator to light.

- The UNIT ACTIVE Indicator

  There is one UNIT ACTIVE indicator. It is turned on when either disc unit is engaged in an I/O function (read, write check, or write). This white indicator is turned off when neither unit is performing a function.

FUNCTIONAL DESCRIPTION

STATES

The dual disc unit can be in one of three states: ready, not ready, or standby. It is possible for one disc unit (one disc spindle) to be in one state and the other to be in a different state.

Ready

A disc unit is in the ready state when all four of the following conditions are met:

- The START control has been activated.
- No malfunctions exist.
- The disc pack is up to operating speed.
- The head assembly has been initially positioned properly.

Not Ready

A disc unit is not ready when it is not in the standby state and any one of the following conditions exists:

- A detectable malfunction exists.
- A malfunction existed and was reset.
- The arm (head assembly) is not positioned properly.
- The disc pack cannot reach operating speed.

A malfunction is defined as a failure to locate an address, whether the fault is mechanical or electronic. Parity errors and dropped clocks are not considered unit malfunctions but are considered to be media malfunctions.

Standby

A disc unit is in the standby state when the following conditions exist:

- The function in progress has been completed.
- The STOP control has been pressed.

NOTE

> A function is defined as a cycle of events that must be completed with no loss of data or control. A malfunction may or may not exist in the standby state.

CHECKING

The integrated disc control generates an odd parity bit for each character written and checks parity for each character read. Parity is recorded during the write operation and checked during the read operation. No record check sum is provided. Disc logic maintains a check on the disc unit itself to determine if detectable hardware malfunctions are occurring. This check ensures that a bit is present during the bit occurrence time period (Manchester recording method permits disc logic to ensure that a bit is written or read

when it should be). When the redundancy check fails, the operation is terminated and the appropriate status character is transmitted from disc control to the processor.

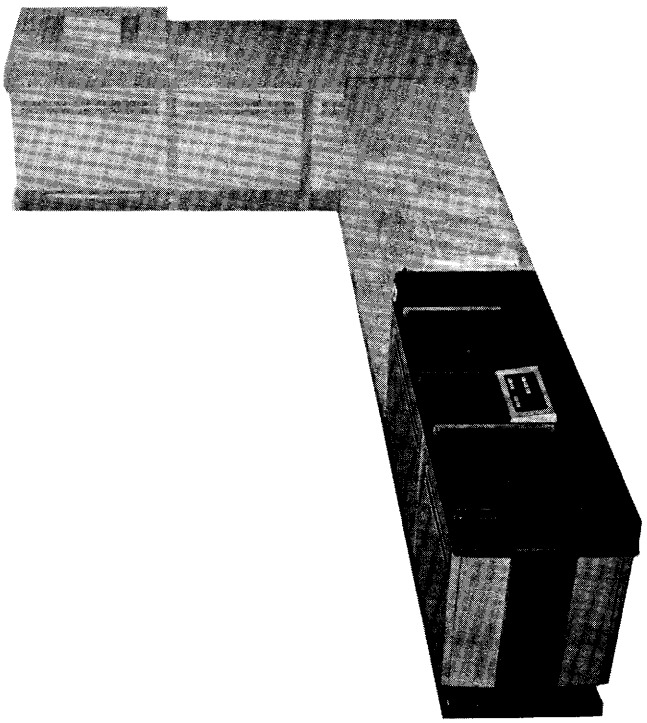
DESELECTION

An S3 status character is always transmitted to the I/O control immediately after the termination of the input/output function. The status character reflects the operation condition of the disc unit and the integrated disc control. When the S3 status character is sent, the integrated disc control deselects itself and the selected disc unit.

NOTE

If the processor is in an error state (ME or PE) an error signal is transmitted to disc control. The integrated disc control and the disc unit are deselected immediately; no additional I/O data is transmitted, the S3 status character is not sent, and all I/O operating functions are terminated. The processor is forced to the appropriate trapping routine; software examines the status of all the peripherals and initiates the proper recovery for each.

NCR CENTURY 100 SYSTEM WITH ONE INTEGRATED DUAL DISC UNIT



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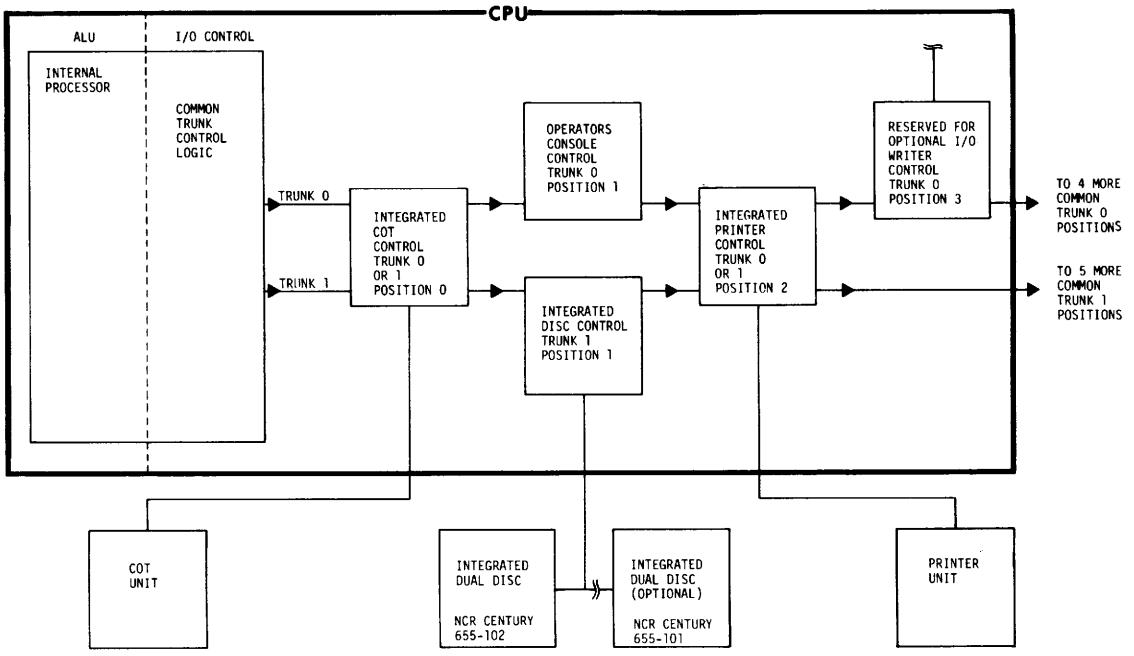
BLOCK DIAGRAM OF NCR CENTURY 100 SYSTEM WITH INTEGRATED DUAL DISC UNIT


CPU
ALU
I/O CONTROL
INTERNAL PROCESSOR
COMMON TRUNK CONTROL LOGIC
TRUNK 0
TRUNK 1
INTEGRATED COT CONTROL TRUNK 0 OR 1 POSITION 0
OPERATORS CONSOLE CONTROL TRUNK 0 POSITION 1
INTEGRATED DISC CONTROL TRUNK 1 POSITION 1
INTEGRATED PRINTER CONTROL TRUNK 0 OR 1 POSITION 2
RESERVED FOR OPTIONAL I/O WRITER CONTROL TRUNK 0 POSITION 3
TO 4 MORE COMMON TRUNK 0 POSITIONS
TO 5 MORE COMMON TRUNK 1 POSITIONS
COT UNIT
INTEGRATED DUAL DISC NCR CENTURY 655-102
INTEGRATED DUAL DISC (OPTIONAL) NCR CENTURY 655-101
PRINTER UNIT

SYSTEM CONFIGURATION

For purposes of explanation the I/O control operation related to disc is divided into two sections: common trunk control logic, and disc control logic (see previous illustration).

Common Trunk Control Logic

Common trunk control logic is the logic required to direct all peripheral operations (selection, data transfer, etc.). This logic is shared by both integrated and common trunk units and permits communication between the processor and the control logic of each peripheral.

Integrated Disc Control Logic

Integrated disc control logic is the specific logic necessary to control the integrated disc. This logic includes input and output buffer registers, address compare logic, etc. Although the disc is permanently assigned to position 1 on trunk 1, it is not physically connected by external means as are the common trunk peripherals; the unit is directly wired into the back panel of the central processing unit (CPU).

The integrated disc unit is designed with a minimum amount of logic that is controlled by the disc control in the I/O control section of the CPU.

The integrated disc operates in the system in the same manner as any common trunk peripheral. That is, the INOUT command is used for selection, and data transfer is accomplished by interrupting the processor only for the time necessary to transfer each character.

FUNCTIONAL OPERATION

Functional operation of the NCR Century 655-101/102 integrated dual disc can be divided into four parts: selection, seeking, data transfer and termination.

Selection

The INOUT command is used to select the desired peripheral. While selecting the disc it also specifies the function (read, write, write check) and the desired sector to be accessed by the use of the PAF.

The eight characters of the INOUT command are defined as follows:

Q	RA	A2	A1	T	RB	B2	B1

Q character — The Q character contains the command code.

A operand — The RA, A2, and A1 characters are used to designate the address in memory of the first character of the peripheral address field (PAF) used for the disc.

T character — The T character is not used in the INOUT command.

B operand — The RB, B2, and B1 characters are used to designate a location in memory for storing the S2 status character upon completion of the command.

- Peripheral Address Field (PAF)

The PAF is a six character field in memory that is used during the execution of the INOUT command to determine the disc unit to be selected, the desired function (read, write, or write check), and the address of the sector to be accessed.

PERIPHERAL ADDRESS FIELD				
P Character	Unit Number	Function Code	Seek Address	Number of Sectors

First PAF Character

8	7	6	5	4	3	2	1
NU	0	0	1	NU	0	0	1

Bits 5, 6, and 7 of the first PAF character designate the trunk number and must contain a binary 1. Bits 1, 2, and 3 designate the position number and must contain a binary 1. (NU=Not used)

Second PAF Character

8	7	6	5	4	3	2	1
NU	NU	0	0	0	0	X	X

Bits 1 through 6 of the second PAF character designate one of the four possible spindles on the two dual disc units. (Spindles 0-3 in binary.)

Third PAF Character

8	7	6	5	4	3	2	1
NOT USED						X	X

Bits 1 and 2 of the third PAF character are used to designate the desired function. Three of the four possible configurations are used.

01 = read
10 = write
11 = write check
00 = illegal (must not be used)

Fourth and Fifth PAF Characters

8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
NOT USED			CYLINDER				TRACK						SECTOR		

Bits 2 through 5 of the fourth PAF character are used to designate the desired cylinder (0 through 15 in binary). Bits 4 through 8 of the fifth PAF character and bit 1 of the fourth are used to designate the desired track (0 through 63 in binary). Bits 1, 2, and 3 of the fifth character are used to designate the desired sector (0 through 7 in binary).

Sixth PAF Character

8	7	6	5	4	3	2	1
NOT USED					0	0	0

The sixth PAF character is not used, nor sent to, the integrated disc. However, bits 1, 2, and 3 must be zero for compatability with other members of the NCR Century Series.

- Response Number

The response number used by the integrated disc is prewired into the logic and cannot be changed as can the response numbers for common trunk peripherals. The response number is used to address control word 3 which contains the information necessary to control I/O operation for the integrated disc.

- Control Word

The control word is an 8-character field in memory, used in the I/O flow to designate the pickup or putaway address, terminating address, and a location to store the S3 status character. The control word used by the disc (control word 3) begins at address 0418 (hex).

INTEGRATED DISC CONTROL WORD						
0418	0419	041A	041B	041C	041D	Memory Address (hex)
S	NA			TA		Character Designation
	N3	N2	N1	T2	T1	

The function of each character of the control word is described below.

S character — The S character is a location in memory reserved for the S3 or S4 status character when the I/O operation is completed.

NA characters — The NA characters specify the next address. Only N1 and N2 are used in the NCR Century 100 System. N3 must be 0, for compatability with other members of the NCR Century series. The NA characters are incremented during each I/O flow so that the next data characters can be accessed.

TA characters — The TA characters specify the terminating address for a block of data. A processor terminate signal is sent to the disc when N1 of the NA address has been incremented to zero and the least-significant bits of N2 equal the least-significant bits of T2 (T1 is not used). The maximum block length for the integrated disc is 512 bytes.

- S2 Status Character

An S2 status character is stored upon termination of the INOUT command. System software interrogates this character, which reflects the result of the attempted selection, and takes whatever action is required. The S2 characters and their meanings are given in the table on the following page.

S2 STATUS CHARACTERS		
CHARACTER	CONDITION	INDICATES
1 0 0 0 0 0 0 0	BUSY	The trunk or peripheral is being used.
1 0 0 0 0 0 1 0	STANDBY	The disc unit was placed in standby by the operator.
0 0 0 0 0 0 1 0	INOPERATIVE	An illegal function code has been used; the disc unit is not turned ON (not answering); the START control has just been activated and the unit is not yet in a ready state, or the disc unit is not in the ready state for any other detectable reason (improper pack loading, head assembly not initially positioned, a reduction in pack speed, CHECK indicator is ON, etc.).
0 1 0 0 0 0 0 0	COMMAND INITIATED	All PAF characters have been received, the selection attempt was successful, and the function (read, write, or write check) has been initiated.

Seeking

The seeking operation is performed in three steps:

- The read/write head is positioned to the correct cylinder.
- The read/write head is selected.
- The correct sector is located.

The location of the access arm is examined to determine whether movement is required. If another cylinder location is desired, the access arm (head assembly) is moved as required. When the access arm is positioned properly, the required read/write head is selected by the stored track number and the operation of locating the desired sector proceeds.

Sector seeking is performed by locating the desired sector on the label track and serially reading the bits from the label track. These bits are compared to the seek address stored in the disc logic. (The cylinder and sector address bits are read from the label track and compared for equality with the bits stored in the disc logic.)

Before any information is read from the label track, the signal adjusting bits (preamble) automatically adjust the reading function for optimum signal output. The first label sync bits are used to identify the start of the address. Four bits are used to verify the cylinder position, and three bits are used to identify the available sector. Multiple recording of the address is used to ensure reliability in locating the desired sector.

Data Transfer

- Writing

The disc control requests the I/O control to output a data character from memory. Each time a character is requested, the unit response number for the disc unit is also sent by the disc control. Characters are transferred from main memory to the integrated disc control. If a memory error is detected by the I/O control, the transmission is terminated and the integrated control and disc units are deselected.

Each character output by the I/O control is stored in the integrated disc control, ready to be output to the disc unit. The disc control generates an odd parity bit for each character, and the resulting 9-bit character is output, bit-serially, to the disc unit.

Before the first data sync character is written in a sector, the signal-adjusting (data preamble) bits and data-begin bits (sync bits) are recorded. The most-significant bit of the character is written first, followed serially with the remaining bits of the character; the parity bit is written after the least-significant bit. Characters are requested by the disc control as rapidly as required to maintain the writing rate. The disc control continues to transmit data to the disc unit until the last character is received from the I/O control. In conjunction with transmitting the last character, the I/O control sends the processor terminate signal. After the last character is written in the sector, a sufficient number of end-of-data characters (postamble bits) are written to complete the record to 512 characters. Additional end-of-data characters are written beyond the 512 characters to complete the recording within a sector.

An abnormal termination occurs when the end-of-data field is detected while the integrated disc control is still receiving data. This situation causes writing to terminate when the sector being written contains 512 data characters and an S3 program error status character to be stored at termination.

- Reading

The integrated disc control reads information from the disc serially, by bit and groups these bits into characters. After each character is assembled and parity is checked, the character is transferred to the output registers. The integrated disc control notifies the I/O control that a data character is ready to be sent and transmits its unit response number.

Before the first data character is read from the sector, the signal adjusting bits (data preamble) automatically adjust the reading components for optimum signal output. The data-begin (sync) bits identify the start of the data bits. The most significant bit is read first and is followed serially by the remaining bits of the character and the parity bit. Characters are read from the disc surface until the end-of-data character (first 9 bits of postamble) is recognized.

The integrated disc control terminates the read function only when the end-of-data bits are detected. When the processor terminate signal is received from the I/O control, transfer of data to the processor is terminated. However, the integrated dual disc control continues reading and checking the data until all the end-of-data bits are detected.

- Write Check

  The write check function is used to verify the reliability of a write operation. It operates in the same manner as a read function, although the data is read on a higher detection level than normal. It is only necessary to specify the reading of one character to initiate the operation, since the disc will read and check parity on the entire field recorded. If an error is detected, the appropriate S3 status character is stored.

  Character transmission from disc control to processor will stop after the one specified character is sent. The write check function will not terminate, normally, until one complete sector has been read.

  Bit transmission from disc unit to integrated control will continue until the sector is completely read or a parity error, dropout, or similar error is detected. The status character sent to the processor at termination is used to determine whether the write function must be re-initiated.

Termination

After the last character is recorded (write) or sent to the processor (read), or if an error condition exists, the disc control generates one additional I/O request and sends with it a peripheral terminate signal. Reception of both signals simultaneously causes the processor to enter the I/O status flow. In the I/O status flow, the selected disc unit is deselected and an S3 status character sent by the disc is stored in a location in memory (S portion of a control word) associated with the disc unit.

When the I/O status operation is completed, the processor returns to the point of command execution that it left to service the I/O termination request, and the disc operation is complete.

The S3 status characters and their meaning are given in the following table.

S3 STATUS CHARACTERS

CHARACTER	CONDITION	INDICATES
0 0 0 0 0 0 1 0	INOPERATIVE	Any function: A malfunction exists, such as a CHECK indication (multiple read/write head selection or write current to a write head at the wrong time), a reduction in pack rotational speed, a power supply failure in the unit, or the unit is no longer in a ready state.
0 0 0 0 0 0 0 1	PROGRAM ERROR	Write Operation only: An attempt to write more than 512 bytes (specified in the control word) has occurred. (1 sector = 512 bytes). More than one sector may be written through the use of software.
0 0 0 1 0 0 0 0	SYSTEM OVERLOAD	Read or Write Check Operation: The processor I/O control is not accepting characters fast enough to maintain the reading rate. All buffer registers are full, the request for service is not being received, and the next character is at the read head. Write Operation: The processor I/O control is not supplying characters fast enough to maintain the writing rate. All buffer registers are empty; the request for service is not being answered, and it is time to write a character.
0 0 1 0 0 0 0 0	DATA ERROR	Read Operation only: A parity error has been detected by disc control. The character that caused this condition may have been read incorrectly (a weak or damaged recording), or was recorded incorrectly (the bits are not spaced properly). In short, a bit did not occur during a bit occurrence time period.

S3 STATUS CHARACTERS [CONT'D]

CHARACTER	CONDITION	INDICATES
0 0 1 0 0 0 1 0	HARDWARE ERROR	Any Function: A malfunction has occurred, e.g., the seek address specified cannot be located (address compare failure); a read/write head malfunctioned (shorted or open), or a bit was not written during a bit occurrence time period.
0 0 0 0 0 0 0 0	OPERATION COMPLETE	Any Function: The designated function (read, write check, or write) has terminated successfully with no error.
1 0 0 0 0 0 0 1	TRANSMISSION ERROR	NONE REQUIRED ON THE INTEGRATED DUAL DISC UNIT: This status character is not required by integrated disc units since, in an integrated I/O operation, data characters are not transferred over the common trunk but are transferred directly through logic when moving between processor and the disc unit. On a write operation, parity is checked as the byte is read out of memory and parity is generated for the byte when it is written on the disc. On a read operation, the parity is checked as the byte is read from the disc, and parity is generated for it as it is written into memory.

SPECIFICATIONS

PHYSICAL SPECIFICATIONS — DUAL—SPINDLE DISC UNIT

CHARACTERISTICS	SPECIFICATIONS
SYSTEM ASSOCIATION	NCR Century 100 only
DIMENSIONS	
LENGTH	58 inches
DEPTH	27 inches
HEIGHT	44 inches
WEIGHT	980 pounds
BAYS	1
AIR FLOW	Bottom to top
NUMBER OF SPINDLES	2
STORAGE CAPACITY (WITH TWO PACKS MOUNTED)	8,388,608 bytes
NUMBER OF ACCESS ARMS (HEAD ASSEMBLIES)	1 per spindle
NUMBER OF ACCESS ARM POSITIONS	16
NUMBER OF READ/WRITE HEADS PER ACCESS ARM	72
NUMBER OF BYTES AVAILABLE (WITHOUT MOVEMENT OF EITHER ARM)	524,288
* HEAD POSITIONING TIME	
MINIMUM (NO CHANGE REQUIRED)	0 ms
MINIMUM (CHANGE REQUIRED)	25 ms
MAXIMUM	60 ms
AVERAGE (WHEN CHANGE REQUIRED)	44.7 ms
TYPE OF UNIT	Integrated
TYPE OF CONTROL	Integrated
ELECTRICAL REQUIREMENTS	Power for NCR Century 655-101, -102 integrated disc units is supplied by the Century 100 processor power supplies.
VOLTAGE (VAC)	
MAXIMUM	
MINIMUM	
STEP VARIATION (WITHIN MAX/MIN)	
CURRENT (AMPERES)	
FREQUENCY (CPS)	
PHASE	
KVA	
CIRCUIT BREAKERS	
NUMBER REQUIRED	1 (on unit)
POLES	1
SIZE (AMPERES)	20 A
BTU/HR	2400
SPINDLE SPEED (RPM)	1440
TRANSFER RATE (KILOBYTES/SEC)	108
CHARACTER TIME (BYTE DURATION IN MICROSECONDS)	9.26
BIT TIME (MICROSECONDS)	1.03

* Head positioning time is the time required to position the head assembly from one cylinder to another if a change in position is necessary.

The required environmental conditions for the NCR 655 Disc Units are the same as they are for the NCR Century System with which it is used.

OPERATING LIMITS	
Temperature	68° to 78°F Dry Bulb
Humidity	40% to 60% Relative

Air Filtration

Computer rooms should be as dust free as possible. Filtering of fresh or makeup air is important. In industrial areas and site locations of high dust content, high efficiency filters should be used. If outside air contains corrosive gases, salts, or conductive dust, special filters should be provided. Under normal conditions, only a minimum amount of air from the building system need be supplied to the computer room to provide pressurization and makeup air.

All NCR Century dual disc units are capable of very reliable operation within the specified limits of their environment, but there are certain other environmental conditions (metal dust, etc.) which may limit reliable disc operation. At the present time, the most serious of these are certain types of solid, airborne particle contaminants in the range of 1-2 1/2 microns (50-100 microinches). If particles of this nature and size get between recording heads and disc pack surfaces, they can cause operating problems. To prevent this, dual disc units filter ambient air twice before it is supplied to the recording areas (once at the base of the disc unit and again at the disc pack base). The level of filtration achieved is more than sufficient to ensure reliability when the disc unit is operating within specified environmental conditions. However, in cases where large concentrations of the type of airborne particles mentioned exist or are anticipated, provisions must be made to provide a normal room particle condition.

Where possible, computer room air filters should have an efficiency rating of at least 35 percent by the National Bureau of Standards discoloration test using atmospheric test dust. Where higher efficiency filters are required, prefilters may be used.

In addition to good air filtration, good housekeeping must be employed to keep the room properly cleaned.

PHYSICAL SPECIFICATIONS — DISC PACK

CHARACTERISTICS	SPECIFICATIONS SPINDLE SPEED = 1440 RPM
DIMENSIONS (INCHES)	
DISC PACK DIAMETER	14.985
DISC PACK HEIGHT	4.028
DISC DIAMETER	14.030 + .005
DISC THICKNESS	0.125 + .000 - .010
DISC COMPOSITION	
BASE METAL	ALUMINUM
RECORDING MATERIAL	COBALT NICKEL PLATING
PROTECTIVE FILM	PROPRIETARY
WEIGHT (LBS)	10
TRANSFER RATE (KB)	108
LATENCY (MS)	20.84
*RECORDING AREA	
**RECORDING LIFE	
***TRACK DEFINITION	
****SECTOR DEFINITION	
TRACK RADIUS (INCHES)	
INNER TRACK	4.485
OUTER TRACK	6.272
TRACK CIRCUMFERENCE (INCHES)	
INNER TRACK	28.18
OUTER TRACK	43.18
BIT DENSITY (BIT/INCH)	
INNER TRACK	1438
OUTER TRACK	938
READ-WRITE HEAD SPACING (INCHES)	.0625
SECTORS/TRACK	8
CAPACITY PER DISC PACK	4,194,304 CHARACTERS BYTES
CYLINDERS PER PACK	16
SECTORS PER TRACK	8
CHARACTERS PER SECTOR	512

* THE MAGNETIC RECORDING AREA ON THE SURFACE OF A DISC IS A CONTINUOUS CIRCUMFERENTIAL BAND HAVING AN INNERMOST DIAMETER OF 8.957 INCHES AND AN OUTERMOST DIAMETER OF 13.758 INCHES.

** READING A PREVIOUSLY RECORDED TRACK SHOULD NOT ADVERSELY AFFECT THE SIGNAL FOR AT LEAST 5 YEARS OF CONTINUOUS SINGLE SHIFT OPERATIONS (10.000 TRACK HOURS EXCLUDING DAMAGED TRACKS).

*** ONE COMPLETE CIRCUMFERENTIAL ROTATION AT A SPECIFIED RADIUS.

**** EXACTLY 1/8TH OF A TRACK.

The required environmental conditions for the NCR 655 Disc Units are the same as they are for the NCR Century System with which it is used.

OPERATING LIMITS

Temperature	68° to 78°F Dry Bulb
Humidity	40% to 60% Relative

NOTE

For optimum performance, the disc pack should be allowed to acclimatize to the computer room by storing it in the computer room for a reasonable period of time before using it. The amount of time necessary for acclimatization depends on the environmental conditions of the last storage location. If the previous storage room has an environment nearly the same as that of the computer room, a minimum period of time would be required for the disc pack to become acclimatized. If the temperature and humidity differences are greater, a longer period of time would be required.

CAUTION

When the temperature of the disc pack is below 50°F, the disc pack should not be carried directly into the computer room environment. Disc packs should be allowed to acclimatize gradually in a general office-type environment to minimize the possibility of condensation forming on the disc surfaces.

OPERATING INSTRUCTIONS

START OF WORKING DAY

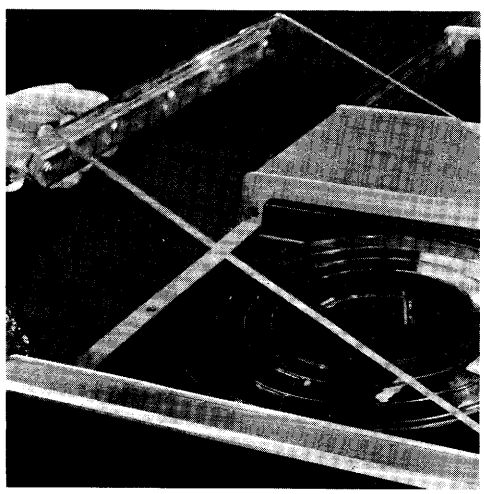
1. Turn on the NCR Century 100 processor. The processor and integrated disc unit share common power supplies.

2. Press the POWER ON button on the disc unit control panel to upsequence both units into the not ready state. This action automatically unlocks both access lids.

LOADING DISC PACKS

1. With power ON, raise the access lid.

2. Place the disc pack down over the spindle, making sure it is properly seated.



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3. Close the access lid. This action causes the dust cover to be raised off the pack automatically.

4. Press the START button for the unit to be used. The disc pack is brought up to proper rotational speed; the brushes perform the sweeping cycle; the read/write arms are positioned in the pack, and the READY indicator lights.

5. If the READY indicator does not light within a brief period of time, a malfunction is indicated. Make certain that the access lid is properly closed and the pack is correctly seated on the spindle.

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UNLOADING DISC PACKS

1. Check the UNIT ACTIVE indicator. If it is lighted one of the units is performing a function. Verify which pack is to be changed.

2. Press the STOP button for the desired spindle. The read/write arm retracts; the spindle drive motor is turned off, and the access lid is unlocked. The spindle is in a standby state.

   If the affected spindle is performing a function, the function is completed before the spindle stops.

   Although access lids are locked during operation, any attempt to raise the lid has the same effect as pressing the STOP button.

   If the START and STOP buttons are accidentally pressed at the same time, the STOP button takes precedence.

3. Open the access lid and lift out the pack. Opening the lid automatically lowers the pack dust cover; lifting the pack automatically locks the dust cover on.

DO'S AND DON'TS OF DISC OPERATION

DISC PACK

DO	DON'T
Use the shipping container for transporting the pack by vehicle.	Consider the dust cover to be adequate protection for extreme handling.
Periodically, check the dust cover for damage; if the cover is cracked or broken, the pack must be sent to NCR Hawthorne.	Drop, throw, slide or otherwise mishandle the pack. Don't use a pack whose dust cover is damaged since the pack surfaces are considered to be contaminated. Significant damage to both the disc pack and disc unit could occur.
Wipe the dust cover with a lint-free cloth or soft paper towel to remove any normal accumulation of dust.	Contaminate a unit by loading a pack that is dirty.
Return disc packs to the appropriate storage location when not in use.	Use any chemical cleaner or abrasive on the dust cover.
Consider the disc and dust cover to be a single unit.	Store packs on the floor or on top of the computer system.
Use a quality label for pack identification.	Attempt to remove the dust cover.
Remove outdated identification labels.	Use a label which, when removed, leaves a glue residue on the dust cover.
Maintain a clean pack storage area.	Attempt to modify a label by erasing. The eraser particles will adhere to the dust cover and could contaminate the disc unit or pack.
Maintain operating and non-operating environmental conditions stated in specifications.	Permit coffee or any other beverages to be placed on or around the disc pack or unit.
Store packs in an upright position. Stacking one upon another is permitted, up to maximum of five packs.	Submit a pack to any strong magnetic fields such as welding transformers, high current distribution panels, or vehicles which use high voltages and current such as subway systems.
	Expose the disc pack to direct sunlight, since the heat created could exceed the environmental specifications.
	Store packs upside down or on edge.
	Exceed maximum of five packs when stacking. Don't store anything on top of a pack except another pack.

DUAL–SPINDLE DISC UNIT	
DO	DON'T
Turn on the unit before attempting to open either access cover. Open access doors and remove the disc packs prior to pressing the POWER OFF button. Close an access door when that spindle is not to be used. Maintain a clean room. Maintain an organized operating area.	Try to open an access cover while power is OFF. Turn OFF the unit with the access covers closed, since the covers will lock and pack removal will be impossible until the unit is turned on again. Permit excess dust to enter the unit. Place coffee or similar beverages on top of the units. Use steel wool floor buffers on any computer site. Steel particles may get into a disc unit and cause damage to a pack or unit. Store a disc pack or anything else on top of a disc unit.